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PART 526. OPEN-SURFACE TANKS

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Rule 3220 Open-surface tanks.

(1) Scope.

(a) This rule applies to all operations involving the immersion of materials in liquids, or in the vapors of such liquids, for the purpose of cleaning or altering their surfaces, or adding or imparting a finish thereto, or changing the character of the materials, and their subsequent removal from the liquids or vapors, draining, and drying. Such operations include washing, electroplating, anodizing, pickling, quenching, dyeing, dipping, tanning, dressing, bleaching, degreasing, alkaline cleaning, stripping, rinsing, digesting, and other similar operations, but do not include molten materials handling operations, or surface-coating operations. [1910.94(d)(1)(i)]

(i) "Molten materials handling operations" means all operations other than welding, burning, and soldering operations, involving the use, melting, smelting, or pouring of metals, alloys, salts, or other similar substances in the molten state. Such operations also include heat treating baths, descaling baths, die casting stereotyping, galvanizing, tinning, and similar operations. [1910.94(d)(13)(ii)]

(ii) "Surface-coating operations" means all operations involving the application of protective, decorative, adhesive, or strengthening coating or impregnation to one or more surfaces, or into the interstices of any object or material, by means of spraying, spreading, flowing, brushing, roll coating, pouring, cementing, or similar means; and any subsequent draining or drying operations, excluding open-tank operations. [1910.94(d)(13)(iii)]

(b) Except where specific construction specifications are prescribed in this section, hoods, ducts, elbows, fans, blowers, and all other exhaust system parts, components, and supports thereof shall be so constructed as to meet conditions of service and to facilitate maintenance and shall conform in construction to the specifications contained in American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, Z9.2-1960. [1910.94(d)(1)(ii)]

(2) Classification of open-surface tank operations.

(a) Open-surface tank operations shall be classified into 16 classes, numbered A-1 to D-4, inclusive. [1910.94(d)(2)(i)]

(b) Determination of class. Class is determined by two factors, hazard potential designed by a letter from A to D, inclusive, and rate of gas, vapor, or mist evolution designated by a number from 1 to 4, inclusive (for example, B.3). [1910.94(d)(2)(ii)]

(c) Hazard potential is an index, on a scale of from A to D, inclusive, of the severity of the hazard associated with the substance contained in the tank because of the toxic, flammable, or explosive nature of the vapor, gas, or mist produced therefrom. The toxic hazard is determined from the concentration, measured in parts by volume of a gas or vapor, per million parts by volume of contaminated air (p.p.m.), or in milligrams of mist per cubic meter of air (mg/m^3), below which ill effects are unlikely to occur to the exposed worker. The concentrations shall be those in Chapter II. [1910.94(d)(2)(iii)]

(d) The relative fire or explosion hazard is measured in degrees Fahrenheit in terms of the closed-cup flash point of the substance in the tank. Detailed information on the prevention of fire hazards in dip tanks may be found in Dip Tanks Containing Flammable or Combustible Liquids, NFPA No. 34-1966, National Fire Protection Association. Where the tank contains a mixture of liquids, other than organic solvents, whose effects are additive, the hygienic

standard of the most toxic component (for example, the one having the lowest p.p.m. or mg/m^3) shall be used, except where such substance constitutes an insignificantly small fraction of the mixture. For mixtures of organic solvents, their combined effect, rather than that of either individually, shall determine the hazard potential. In the absence of information to the contrary, the effects shall be considered as additive. If the sum of the ratios of the airborne concentration of each contaminant to the toxic concentration of that contaminant exceeds unity, the toxic concentration shall be considered to have been exceeded. (See Note A to paragraph (e) of this subsection.) [1910.94(d)(2)(iv)]

(e) Hazard potential shall be determined from Table G-12, with the value indicating greater hazard being used. When the hazardous material may be either a vapor with a threshold limit value (TLV) in p.p.m. or a mist with a TLV in mg/m^3, the TLV indicating the greater hazard shall be used (for example, A takes precedence over B or C; B over C; C over D). [1910.94(d)(2)(v)]

Note A:

$$\frac{c_1}{TLV_1} \quad \frac{c_2}{TLV_2} \quad \frac{c_3}{TLV_3} + \ldots \frac{c_n}{TLV_n} > 1$$

where:
c = Concentration measured at the operation in p.p.m.

TABLE G-12
DETERMINATION OF HAZARD POTENTIAL

Hazard potential	Toxicity Group		
	Gas or vapor (p.p.m.)	Mist (mg/m^3)	Flash point (in degrees F.)
A	0-10	0-0.1	-------
B	11-100	0.11-1.0	Under 100
C	101-500	1.1-10	100-200
D	over 500	over 10	over 200

[1910.94(d)(2)(v)]

(f) Rate of gas, vapor or mist evolution is a numerical index, on a scale of from 1 to 4, inclusive, both of the relative capacity of the tank to produce gas, vapor, or mist and of the relative energy with which it is projected or carried upwards from the tank. Rate is evaluated in terms of the following: [1910.94(d)(2)(vi)]

(i) The temperature of the liquid in the tank in degree Fahrenheit; [1910.94(d)(2)(vi)(a)]

(ii) The number of degrees Fahrenheit that this temperature is below the boiling point of the liquid in degrees Fahrenheit; [1910.94(d)(2)(vi)(b)]

(iii) The relative evaporation of the liquid in still air at room temperature in an arbitrary scale--fast, medium, slow, or nil; and [1910.94(d)(2)(vi)(c)]

(iv) The extent that the tank gases or produces mist in an arbitrary scale--high, medium, low, and nil. (See Table G-13, Note 2.) Gassing depends upon electrochemical or mechanical processes, the effects of which have to be individually evaluated for each installation (see Table G-13, Note 3). [1910.94(d)(2)(vi)(d)]

(g) Rate of evolution shall be determined from Table G-13. When evaporation and gassing yield different rates, the lowest numerical value shall be used. [1910.94(d)(2)(vii)]

TABLE G-13
DETERMINATION OF RATE OF GAS, VAPOR, OR MIST EVOLUTION[1]

Rate	Liquid temperature, "F	Degrees below boiling point	Relative evaporation[2]	Gassing[3]
1	Over 200	0-20	Fast	High
2	150-200	21-50	Medium	Medium
3	94-140	51-100	Slow	Low
4	Under 94	Over 100	Nil	Nil

Note 1. In certain classes of equipment, specifically vapor degreasers, an internal condenser or vapor level thermostat is used to prevent the vapor from leaving the tank during normal operation. In such cases, rate of vapor evolution from the tank into the workroom is not dependent upon the factors listed in the table, but rather upon abnormalities of operating procedures, such as carryout of vapors from excessively fast action, dragout of liquid by entrainment in parts, contamination of solvent by water and other materials, or improper heat balance. When operating procedure is excellent, effective rate of evolution may be taken as 4. When operating procedure is average, the effective rate of evolution may be taken as 3. When operation is poor, a rate of 2 or 1 is indicated, depending upon observed conditions.

Note 2. Relative evaporation rate is determined according to the methods described by A.K. Doolittle in Industrial and Engineering Chemistry, vol. 27, p. 1169, (3) where time for 100-percent evaporation is as follows: Fast: 0-3 hours; Medium: 3-12 hours; Slow: 12-50 hours; Nil: more than 50 hours.

Note 3. Gassing means the formation by chemical or electrochemical action of minute bubbles of gas under the surface of the liquid in the tank and is generally limited to aqueous solutions.

(3) Ventilation. Where ventilation is used to control potential exposures to workers as defined in paragraph (2)(c) of this rule, it shall be adequate to reduce the concentration of the air contaminant to the degree that a hazard to the workers does not exist. Methods of ventilation are discussed in American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems Z9.2-1960. [1910.94(d)(3)]

(4) Control requirements.

(a) Control velocities shall conform to Table G-14 in all cases where the blow of air past the breathing or working zone of the operator and into the hoods is undistributed by local environmental conditions, such as open windows, wall fans, unit heaters, or moving machinery. [1910.94(d)(4)(i)]

TABLE G-14
CONTROL VELOCITIES IN FEET PER MINUTE (F.P.M.) FOR UNDISTURBED LOCATIONS

Class	Enclosing Hood			Canopy Hood[2]	
	One open side	Two open sides	Lateral exhaust[1]	Three open sides	Four open sides
A-1& A-2	100	150	150	Do not use	Do not use
A-3 (Note 2), B-1, B-2, & C-1	75	100	100	125	175
B-3, C-2, & D-1, (Note 3)	65	90	75	100	150
A-4, (Note 2), C-3, & D-2, (Note 3)	50	75	50	75	125
B-4, C-4, D-3, (Note 3), & D-4	General room ventilation required.				

Notes:
1. See Table G-15 for computation of ventilation rate.
2. Do not use canopy hood for Hazard Potential A processes.
3. Where complete control of hot water is desired, design as next highest class.

(b) All tanks exhausted by means of hood which, [1910.94(d)(4)(ii)]
   (i) Project over the entire tank; [1910.94(d)(4)(ii)(a)]
   (ii) Are fixed in position in such a location that the head of the workman, in all his normal operating positions while working at the tank, is in front of all hood openings; and [1910.94(d)(4)(ii)(b)]
   (iii) Are completely enclosed on at least two sides, shall be considered to be exhausted through an enclosing hood. [1910.94(d)(4)(ii)(c)]
   (iv) The quantity of air in cubic feet per minute necessary to be exhausted through an enclosing hood shall be not less than the product of the control velocity times the net area of all openings in the enclosure through which air can flow into the hood. [1910.94(d)(4)(ii)(d)]

(c) All tanks exhausted by means of hoods which do not project over the entire tank, and in which the direction of air movement into the hood or hoods is substantially horizontal, shall be considered to be laterally exhausted. The quantity of air in cubic feet per minute necessary to be laterally exhausted per square foot of tank area in order to maintain the required control velocity shall be determined from Table G-15 for all variations in ratio of tank width (W) to tank length (L). The total quantity of air in cubic feet per minute required to be exhausted per tank shall be not less than the product of the area of tank surface times the cubic feet per minute per square foot of tank area, determined from Table G-15. [1910.94(d)(4)(iii)]

TABLE G-15
MINIMUM VENTILATION RATE IN CUBIC FEET OF AIR PER MINUTE
PER SQUARE FOOT OF TANK AREA FOR LATERAL EXHAUST

Required minimum control velocity, f.p.m. (from table G-14)	C.f.m. per square feet to maintain required minimum velocities at following ratios (tank width (W) / tank length (L)) .1,2				
	0.0 to 0.09	0.1 to 0.24	0.25 to 0.49	0.5 to 0.99	1.0 to 2.0
Hood along one side or two parallel sides of tank when one hood is against a wall or baffle.[2] Also for a manifold along tank centerline.[3]					
50	50	60	75	90	100
75	75	90	110	130	150
100	100	125	150	175	200
150	150	190	225	260	300
Hood along one side or two parallel sides of free standing tank not against wall or baffle.					
50	75	90	100	110	125
75	110	130	150	170	190
100	150	175	200	225	250
150	225	260	300	340	375

[1] It is not practicable to ventilate across the long dimension to a tank whose ratio $\frac{W}{L}$ exceeds 2.0. It is undesirable to do so when $\frac{W}{L}$ exceeds 1.0. For circular tanks with lateral exhaust along up to 1/2 the circumference, use W/L=1.0; for over one-half the circumference use W/L = 0.5.

[2] Baffle is a vertical plate the same length as the tank, and with the top of the plate as high as the tank is wide. If the exhaust hood is on the side of a tank against a building wall or close to it, it is perfectly baffled.

[3] Use $\frac{W}{2}$ as tank width in computing when manifold is along centerline, or when hoods are used on two parallel sides of a tank.

Tank Width (W) means the effective width over which the hood must pull air to operate (for example, where the hood face is set back from the edge of the tank, this set back must be added in measuring tank width). The surface area of tanks can frequently be reduced and better control obtained (particularly on conveyorized systems) by using covers extending from the upper edges of the slots toward the center of the tank.

(ii) For lateral exhaust hoods over 42 inches wide, or where it is desirable to reduce the amount of air removed from the workroom, air supply slots or orifices shall be provided along the sides or the center of the tank opposite from the exhaust slots. The design of such systems shall meet the following criteria: [1910.94(d)(4)(iii)(a)]

(A) The supply air volume plus the entrained air shall not exceed 50 percent of the exhaust volume. [1910.94(d)(4)(iii)(a)(1)]

(B) The velocity of the supply air-stream as it reaches the effective control area of the exhaust slot shall be less than the effective velocity over the exhaust slot area. [1910.94(d)(4)(iii)(a)(2)]

(C) The vertical height of the receiving exhaust hood, including any baffle, shall not be less than one-quarter the width of the tank. [1910.94(d)(4)(iii)(a)(3)]

(D) The supply air-stream shall not be allowed to impinge on obstructions between it and the exhaust slot in such a manner as to significantly interfere with the performance of the exhaust hood. [1910.94(d)(4)(iii)(a)(4)]

(E) Since most failure of push-pull systems result from excessive supply air volumes and pressures, methods of measuring and adjusting the supply air shall be provided. When satisfactory control has been achieved, the adjustable features of the hood shall be fixed so that they will not be altered. [1910.94(d)(4)(iii)(a)(5)]

(d) All tanks exhausted by means of hoods which project over the entire tank, and which do not conform to the definition of enclosing hoods, shall be considered to be overhead canopy hoods. The quantity of air in cubic feet per minute necessary to be exhaust through a canopy hood shall be not less than the product of the control velocity times the net area of all openings between the bottom edges of the hood and the top edges of the tank. [1910.94(d)(4)(iv)]

(e) The rate of vapor evolution (including steam or products of combustion) from the process shall be estimated. If the rate of vapor evolution is equal to or greater than 10 percent of the calculated exhaust volume required, the exhaust volume shall be increased in equal amount. [1910.94(d)(4)(v)]

(5) Spray cleaning and degreasing. Wherever spraying or other mechanical means are used to disperse a liquid above an open surface tank, control must be provided for the

airborne spray. Such operations shall be enclosed as completely as possible. The inward air velocity into the enclosure shall be sufficient to prevent the discharge of spray into the workroom. Mechanical baffles may be used to help prevent the discharge of spray. Spray painting operations are covered by Rule 3235. [1910.94(d)(5)]

(6) Control means other than ventilation. Tank covers, foams, beads, chips, or other materials floating on the tank surface so as to confine gases, mists, or vapors to the area under the cover or to the foam, bead, or chip layer; or surface tension depressive agents added to the liquid in the tank to minimize mist formation, or any combination thereof, may all be used as gas, mist, or vapor control means for open-surface tank operations, provided that they effectively reduce the concentrations of hazardous materials in the vicinity of the worker below the limits set in accordance with subsection (2) of this rule. [1910.94(d)(6)]

(7) System design.

(a) The equipment for exhausting air shall have sufficient capacity to produce the flow of air required in each of the hoods and openings of the system. [1910.94(d)(7)(i)]

(b) The capacity required in paragraph (a) of this subsection shall be obtained when the airflow producing equipment is operating against the following pressure losses, the sum of which is the static pressure: [1910.94(d)(7)(ii)]

(i) Entrance losses into the hood. [1910.94(d)(7)(ii)(a)]

(ii) Resistance to airflow in branch pipe including bends and transformations. [1910.94(d)(7)(ii)(b)]

(iii) Entrance loss into the main pipe. [1910.94(d)(7)(ii)(c)]

(iv) Resistance to airflow in main pipe including bends and transformations. [1910.94(d)(7)(ii)(d)]

(v) Resistance of mechanical equipment; that is, filters, washers, condensers, absorbers, etc., plus their entrance and exit losses. [1910.94(d)(7)(ii)(e)]

(vi) Resistance in outlet duct and discharge stack. [1910.94(d)(7)(ii)(f)]

(c) Two or more operations shall not be connected to the same exhaust system where either one or the combination of the substances removed may constitute a fire, explosion, or chemical reaction hazard in the duct system. Traps or other devices shall be provided to insure that condensate in ducts does not drain back into the tank. [1910.94(d)(7)(iii)]

(d) The exhaust system, consisting of hoods, ducts, air mover, and discharge outlet shall be designed in accordance with American National Standard Fundamentals Governing and Design and Operation of Local Exhaust Systems, Z9.2-1960, or the manual, Industrial Ventilation, published by the American Conference of Governmental Industrial Hygienists 1970. Airflow and pressure loss data provided by the manufacturer of any air cleaning device shall be included in the design calculations. [1910.94(d)(7)(iv)]

(8) Operation.

(a) The required airflow shall be maintained at all times during which gas, mist or vapor is emitted from the tank and at all times the tank, the draining, or the drying area is in operation or use. When the system is first installed, the airflow from each hood shall be measured by means of a pitot traverse in the exhaust duct and corrective action taken if the flow is less than that required. When the proper flow is obtained, the hood static pressure shall be measured and recorded. At intervals of not more than 3 months operation, or after a prolonged shutdown period, the hoods and duct system shall be inspected for evidence of corrosion or damage. In any case where the airflow is found to be less that required, it shall be increased to the required value. (Information on airflow and static pressure measurement and calculations may be found in American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, Z9.2-1960, or in the manual, Industrial Ventilation, published by the American Conference of Governmental Industrial Hygienists.) [1910.94(d)(8)(i)]

(b) The exhaust system shall discharge to the outer air in such a manner that the possibility of its effluent entering any building is at a minimum. Recirculation shall only be through a device for contaminant removal which will prevent the creation of a health hazard in the room or area to which the air is recirculated (see Rule 3101(10)). [1910.94(d)(8)(ii)]

(c) A volume of outside air in the range of 90 percent to 110 percent of the exhaust volume shall be provided to each room having exhaust hoods. The outside air supply shall enter the workroom in such a manner as not to be detrimental to any exhaust hood. The airflow of the make-up air system shall be measured on installation. Periodically, thereafter, the airflow should be remeasured, and corrective action shall be taken when the airflow is below that required. The make-up air shall be uncontaminated. [1910.94(d)(8)(iii)]

(9) Personal protection.

(a) All employees working in and around open-surface tank operations must be instructed as to the hazards of their respective jobs, and in the personal protection and first-aid procedures application to these hazards. [1910.94(d)(9)(i)]

(b) Personal protective clothing requirements for persons engaged in open-surface tank operations are set forth in the Occupational Safety Standards for General Industry.

(c) When, during emergencies as described in paragraph (11)(e) of this rule, workers must be in areas where concentrations of air contaminants are greater than the limit set by paragraph (2)(c) of this rule or oxygen concentrations are less than 19.5 percent, they shall be required to wear respirators adequate to reduce their exposure to a level below these limits, or to provide adequate oxygen. Such respirators shall also be provided in marked, quickly accessible storage compartments built for the purpose, when there exists the possibility of accidental release of hazardous concentrations of air contaminants. Respirators shall be approved by the U.S. Bureau of Mines, U.S. Department of Interior and shall be selected by a competent industrial hygienist or other technically qualified source. Respirators shall be used in accordance with Rule 3501 and 3502, and persons who may require them shall be trained in their use. [1910.94(d)(9)(vi)]

(d) Near each tank containing a liquid which may burn, irritate, or otherwise be harmful to the skin if splashed upon the worker's body, there shall be a supply of clean cold water. The water pipe (carrying a pressure not exceeding 25 pounds) shall be provided with a quick opening valve and at least 48 inches of hose not smaller than three-fourths inch, so that no time may be lost in washing off liquids from the skin or clothing. Alternatively, deluge showers and eye flushes shall be provided in cases where harmful chemicals may be splashed on parts of the body. [1910.94(d)(9)(vii)]

(e) Operators with sores, burns, or other skin lesions requiring medical treatment shall not be allowed to work at their regular operations until so authorized by a physician. Any small skin abrasions, cuts, rash, or open sores which are found or reported shall be treated by a properly designated person so that chances of exposures to the chemicals are removed. Workers exposed to chromic acid shall have a periodic examinations made of the nostrils and other parts of the body, to detect incipient ulceration. [1910.94(d)(9)(viii)]

(f) Sufficient washing facilities, including soap, individual towels, and hot water, shall be provided for all persons required to use or handle any liquids which may burn, irritate, or otherwise be harmful to the skin, on the basis of at least one basin (or its equivalent) with a hot water faucet for every 10 employees. See Rule 4201. [1910.94(d)(9)(ix)]

(g) Locker space or equivalent clothing storage facilities shall be provided to prevent contamination of street clothing (see Rule 4201). [1910.94(d)(9)(x)]

(h) First aid facilities specific to the hazards of the operations conducted shall be readily available (see Rule 4401). [1910.94(d)(9)(xi)]

(10) Special precautions for cyanide. Dikes or other arrangements shall be provided to prevent the possibility of intermixing of cyanide and acid in the event of tank rupture. [1910.94(d)(10)]

(11) Inspection, maintenance, and installation.

(a) Floors and platforms around tanks shall be prevented from becoming slippery both by original type of construction and by frequent flushing. They shall be firm, sound, and of the design and construction to minimize the possibility of tripping. [1910.94(d)(11)(i)]

(b) Before cleaning the interior of any tank, the contents shall be drained off, and the cleanout doors shall be opened where provided. All pockets in tanks or pits, where it is possible for hazardous vapors to collect, shall be ventilated and cleared of such vapors. [1910.94(d)(11)(ii)]

(c) Tanks which have been drained to permit employees to enter for the purposes of cleaning, inspection, or maintenance may contain atmospheres which are hazardous to life or health, through the presence of flammable or toxic air contaminants, or through the absence of sufficient oxygen. Before employees shall be permitted to enter any such tank, appropriate tests of the atmosphere shall be made to determine if the limits set by paragraph (2)(c) of this rule are exceeded, or if the oxygen concentration is less than 19.5 percent (see Rule 3303). [1910.94(d)(11)(iii)]

(d) If the tests made in accordance with paragraph (c) of this subsection indicates that the atmosphere in the tank is unsafe, before any employee is permitted to enter the tank, the tank shall be ventilated until the hazardous atmosphere is removed, and ventilation shall be continued so as to prevent the occurrence of a hazardous atmosphere as long as an employee is in the tank (see Rule 3303). [1910.94(d)(11)(iv)]

(e) If, in emergencies, such as rescue work, it is necessary to enter a tank which may contain a hazardous atmosphere, suitable respirators, such as self-contained breathing apparatus; hose mask with blower, if there is a possibility of oxygen deficiency; or a gas mask, selected and operated in accordance with paragraph (9)(c) of this rule, shall be used. If a contaminant in the tank can cause dermatitis, or be absorbed through the skin, the employee entering the tank shall also wear protective clothing. At least one trained standby employee, with suitable respirator, shall be present in the nearest uncontaminated area. The standby employee must be able to communicate with the employee in the tank and be able to haul him out of the tank with a lifeline if necessary (see Rule 3303). [1910.94(d)(11)(v)]

(f) Maintenance work requiring welding or open flame, where toxic metal fumes such as cadmium, chromium, or lead may be evolved, shall be done only with sufficient local exhaust ventilation to prevent the creation of a health hazard, or be done with respirators selected and used in accordance with paragraph (9)(c) of this rule. Welding or the use of open flames near any solvent cleaning equipment shall be permitted only after such equipment has first been thoroughly cleared of solvents and vapors. [1910.94(d)(11)(vi)]

(12) Vapor degreasing tanks.

(a) In any vapor degreasing tank equipped with a condenser or vapor level thermostat, the condenser or thermostat shall keep the level of vapors below the top edge of the tank by a distance at least equal to one-half the tank width, or at least 36 inches, whichever is shorter. [1910.94(d)(12)(i)]

(b) Where gas is used as a fuel for heating vapor degreasing tanks, the combustion chamber shall be of tight construction, except for such openings as the exhaust flue, and those that are necessary for supplying air for combustion. Flues shall be of corrosion-resistant construction and shall extend to the outer air. If mechanical exhaust is used on this flue, a draft diverter shall be used. Special precautions must be taken to prevent solvent fumes from entering the combustion air of this or any other heater when chlorinated or fluorinated hydrocarbon solvents (for example, trichloroethylene, Freon) are used. [1910.94(d)(12)(ii)]

(c) Heating elements shall be so designed and maintained that their surface temperature will not cause the solvent or mixture to decompose, break down, or be converted into an excessive quantity of vapor. [1910.94(d)(12)(iii)]

(d) Tanks or machines of more than 4 square feet of vapor area, used for solvent cleaning or vapor degreasing, shall be equipped with suitable cleanout or sludge doors located near the bottom of each tank or still. These doors shall be so designed and gasketed that there will be no leakage of solvent when they are closed. [1910.94(d)(12)(iv)]

(13) Ventilation for Dip Tanks Containing Flammable or Combustible Liquids.

(a) Definitions applicable to this subsection. [1910.108(a)]

(i) "Dip tank" shall mean a tank, vat, or container of flammable or combustible liquid in which articles or materials are immersed for the purpose of coating, finishing, treating, or similar processes. [1910.108(a)(1)]

(ii) "Vapor area" shall mean any area containing dangerous quantities of flammable vapors in the vicinity of dip tanks, their drainboards or associated drying, conveying, or other equipment, during operation or shutdown periods. [1910.108(a)(2)]

(b) Ventilation.

(i) Vapor area ventilation. Vapor areas as defined in subdivision (a)(ii) of this subsection shall be limited to the smallest practical space by maintaining a properly designed system of mechanical ventilation arranged to move air from all directions towards the vapor area origin and thence to a safe outside location. Ventilating systems shall conform to the Standards for Blower and Exhaust Systems (NFPA Pamphlet No. 91-1969). Required ventilating systems shall be so arranged that the failure of any ventilating fan shall automatically stop any dipping conveyor system. See also Occupational Safety Standards for General Industry. [1910.108(b)(1)]

(ii) Ventilation combined with drying. When a required ventilating system serves associated drying operations utilizing a heating system which may be a source of ignition, means shall be provided for preventilation before the heating system can be started; the failure of any ventilating fan shall automatically shut down the heating system; and the installation shall otherwise conform to the Standard for Ovens and Furnaces (NFPA No. 86A-1969). [1910.108(b)(2)]

(c) Operations and maintenance.

Inspection. Periodic inspection or tests of all dip tank facilities shall be made, including covers, overflow pipe inlets and discharge, bottom drains and valves, electrical wiring and equipment and grounding connections, ventilating facilities, and all extinguishing equipment. Any defects found shall be promptly corrected. [1910.108(f)(3)]

(d) Special dip tank applications.

(i) Electrostatic apparatus; general.

(A) Installation and use of electrostatic detearing equipment shall conform to this subsection. [1910.108(h)(3)(i)]

(B) Electrostatic apparatus shall be equipped with automatic controls which will operate without time delay to disconnect the power supply to the high voltage transformer and to signal the operator upon stoppage of ventilating fans or failure of ventilating equipment from any cause. [1910.108(h)(3)(ix)(a)]

(C) The detearing area shall be ventilated by exhausting adequate air from the area as specified in paragraph (b) of this subsection. [1910.108(h)(3)(xii)]

(ii) Roll coating.

(A) The processes of roll coating, spreading, and impregnating, in which fabrics, paper, or other materials are passed directly through a tank or trough containing flammable or combustible liquids, or over the surface of a roller that revolves partially submerged in a Class I or Class II liquid, as these terms are defined in Rule 3110, shall conform to the applicable requirements of this subsection and shall conform to the Occupational Safety Standards for General Industry. [1910.108(h)(4)(i)]

(B) Adequate arrangements shall be made to prevent sparks from static electricity by electrically bonding and grounding all metallic rotating and other parts of machinery and equipment and by the installation of static collectors or maintaining a conductive atmosphere such as a high relative humidity. [1910.108(h)(4)(ii)]

(iii) Additional safety requirements. Additional safety requirements for dip tanks containing flammable or combustible liquids are found in the Occupational Safety Standards for General Industry.

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